Department of the Navy
Proposed Final Remedy for OU-1A
Extraction and Treatment of Area A Groundwater

Naval Air Warfare Center
Warminster, Pennsylvania **July 2000**

NAVY ANNOUNCES PROPOSED PLAN

The Department of the Navy has completed a Remedial Investigation / Feasibility Study (RI/FS) for Operable Unit 1A (OU-1A) at the Naval Air Warfare Center (NAWC or "the Site") in Warminster, Pennsylvania. OU-1A consists of contaminated groundwater attributable to Area A at the Site (hereafter referred to as "Area A groundwater"). This RI/FS has been completed as part of the Navy's Installation Restoration Program (IRP) and the Superfund Remedial Program. The purpose of an RI is to determine the nature and extent of contaminated media while the purpose of an FS is to evaluate remedial alternatives for contamination of concern.

This final RI/FS follows an interim RI/FS for OU-1 issued in April 1993 to support an interim Record of Decision (ROD) for OU-1 issued in September 1993. The interim ROD for OU-1 selected an interim remedy of pumping and treatment of Area A and Area B groundwater to limit contaminant migration while studies were completed to determine the full nature and extent of contamination. This Proposed Plan summarizes the findings of the final RI/FS for Area A groundwater which is now considered OU-1A, which includes the results of RI work conducted since the issuance of the interim remedy ROD and evaluates alternatives for a final remedy based on this information. This Proposed Plan also proposes a final remedy for OU-1A that consists of pumping, treatment and discharge of groundwater, institutional controls, and groundwater monitoring. This Proposed Plan also provides a rationale for this proposal. In addition, the Proposed Plan explains how the public can participate in the decision-making process and provides addresses and telephone numbers for the appropriate Navy contacts.

NOTE: A glossary of relevant technical and regulatory terms is provided at the end of this Proposed Plan. These terms are indicated in **boldface** within the Proposed Plan.

This document is issued by the Navy, the lead agency for IRP and Superfund activities at the Site, and by EPA, the support agency for Superfund actions. The Navy and EPA will issue a final decision regarding the disposition of Area A after the public comment period has ended and the comments submitted during this time have been reviewed and considered.

The Navy is issuing this Proposed Plan as part of its public participation responsibilities under Sections 113 (k), 117(a), and 121(f) of the **Comprehensive Environmental Response, Compensation, and Liability Act** (CERCLA, commonly referred to as the Superfund Law), as amended by the Superfund Amendments and Reauthorization Act. This document summarizes information that can be found in greater detail in the final **Remedial Investigation/Feasibility Study** (RI/FS) report for Area A Groundwater and other Site documents contained in the **administrative record** file for this Site. The Navy invites the public to review these documents and to comment on all of the alternatives presented in this Proposed Plan during the comment period since the Navy and EPA may modify this preferred alternative or select another response action presented in this Proposed Plan. The administrative record file, which supports this Proposed Plan, is available for review at the Caretaker Site Office, 860 Flamingo Alley, Warminster, Pennsylvania 18974; (215) 441-2043 Hours: Monday - Friday, 9 a.m. - 4 p.m. or at the Bucks County Library 150 South Pine Street, Doylestown, PA 18901 (215) 348-

9081; Hours: Monday - Thursday, 9 a.m. - 9 p.m. Friday, 9 a.m - 6 p.m.; Saturday, 9 a m. - 5 p.m.

A final groundwater remedy for Area A will be documented in a Record of Decision (ROD) which will be issued after all public comments are considered. The ROD will be placed in the administrative record file for review by the public.

This is the tenth Proposed Plan issued by the Navy for the Site. The first Proposed Plan was issued on April 26, 1993, and addressed Operable Unit 1 (OU-1), which included contaminated groundwater in overburden and shallow bedrock attributable to Area A and Area B at NAWC. Subsequent to the issuance of the Proposed Plan for OU-1, the Navy and EPA conducted a Superfund Removal Action, providing water treatment system and public water connections to residences in the vicinity of NAWC. This Removal Action was designated as Operable Unit 2 (OU-2). Due to the time-critical nature of this Removal Action, a Proposed Plan was not issued for OU-2. The second Proposed Plan was issued on August 19, 1994, and addressed Operable Unit 3 (OU-3), which included contaminated groundwater attributable to Area C at NAWC. Since the issuance of the Proposed Plan and subsequent Records of Decisions for OU-1 and OU-3, a groundwater treatment plant has been constructed within Area A and the cleanup of contaminated groundwater attributable to both Area A and Area C has begun. The third Proposed Plan was issued on June 5, 1997, and addressed contaminated groundwater attributable to Area D at NAWC, or Operable Unit 4 (OU-4). A Record of Decision for OU-4 was issued and cleanup of contaminated groundwater attributable to Area D has also been initiated. The fourth Proposed Plan was issued on August 20, 1999, and addressed soil, sediment and surface wat r associated with Site 8, or Operable Unit 5 (OU-5). A Record of Decision for OU-5 was issued on September 29, 1999. The fifth and sixth Proposed Plans were issued concurrently on February 14, 2000 and address Sites 6 and 7 (OU-7) and Site 4 (OU-6), respectively. The seventh, eighth and ninth Proposed Plans were issued on May 1, 2000 and address Area D soils (OU-8), Area D groundwater (OU-4), and Area A soils (OU-9), respectively. This Proposed Plan is being issued concurrently with the Proposed Plan addressing Area B groundwater (OU-1B).

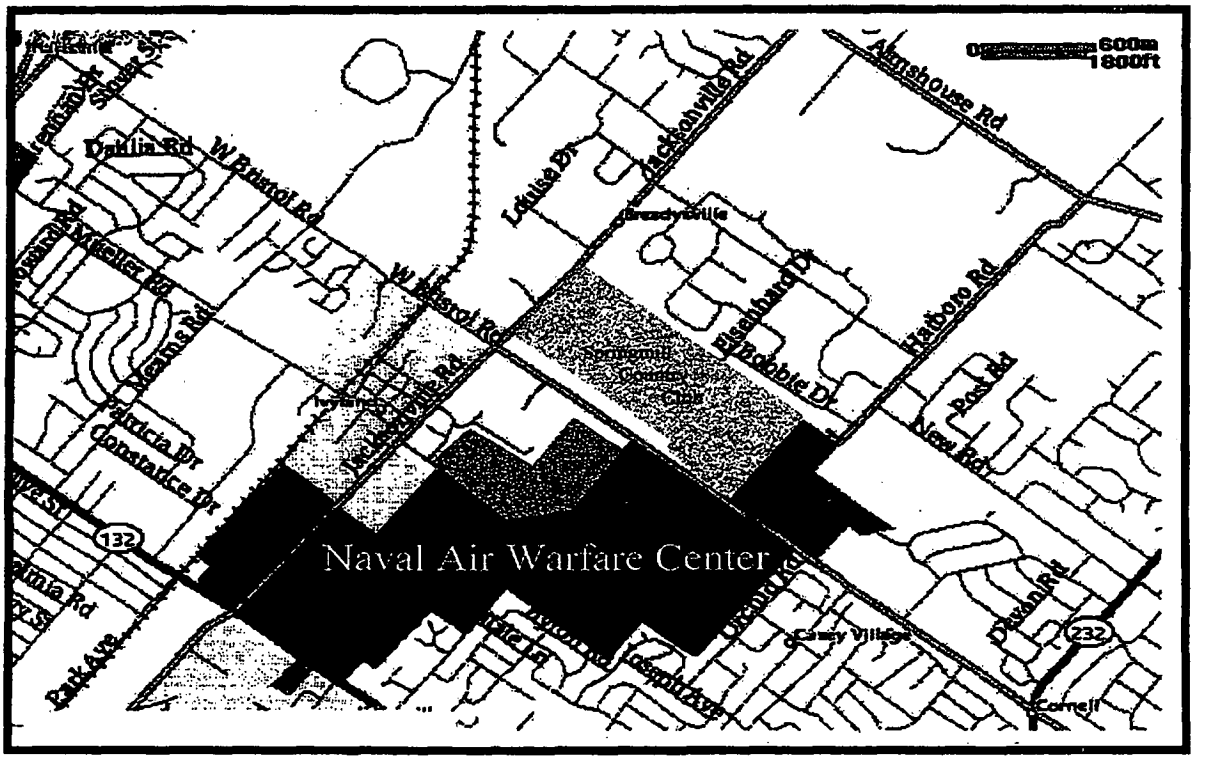

Figure 1. The former NAWC, Warminster, PA

SITE BACKGROUND

NAWC is a 824-acre facility located in Warminster Township, Northampton Township and Ivyland Borough, Bucks County, Pennsylvania (see Figure 1 for Site Location Map). As a result of the Base Realignment and Closure Act (BRAC), NAWC ceased operations on September 30, 1996. The majority of NAWC is being transferred to the private sector.

The facility lies in a populated suburban area surrounded by private homes, various commercial and industrial activities, and a golf course. On-base areas include various buildings and other complexes connected by paved roads, the runway and ramp area, mowed fields, and a small wooded area.

Commissioned in 1944, the facility's main function was research, development, testing, and evaluation for naval aircraft systems. NAWC also conducted studies in anti-submarine warfare systems and software development. Historically, wastes were generated during aircraft maintenance and repair, pest control, fire-fighting training, machine and plating shop operations, spray painting, and various materials research and testing activities in laboratories. These wastes included paints, solvents, sludges from industrial wastewater treatment, and waste oils that were disposed in several pits, trenches, and landfills throughout the facility property. NAWC was listed on the Superfund **National Priorities List** in 1989. This list includes sites where uncontrolled hazardous substance releases present the most significant potential threats to human health and the environment. Areas reported by the Navy to have been potentially used for disposal of hazardous substances include eight locations covering more than 7 acres. These locations include the following:

Three waste disposal locations (sites 1,3, and 6)

Two sludge disposal pit locations (sites 2 and 7)

Two landfills (sites 4 and 5)

One fire training location (site 8)

These disposal locations have since been grouped within the following areas on NAWC property: Area A (sites 1, 2, and 3); Area B (sites 5, 6, and 7); and Area C (sites 4 and 8). Figure 2 provides the location of these areas.

Area A generally consists of Sites 1, 2, and 3 and adjacent areas in the northwest corner of the facility. Area A is bordered by light industrial commercial areas to the north and west. The

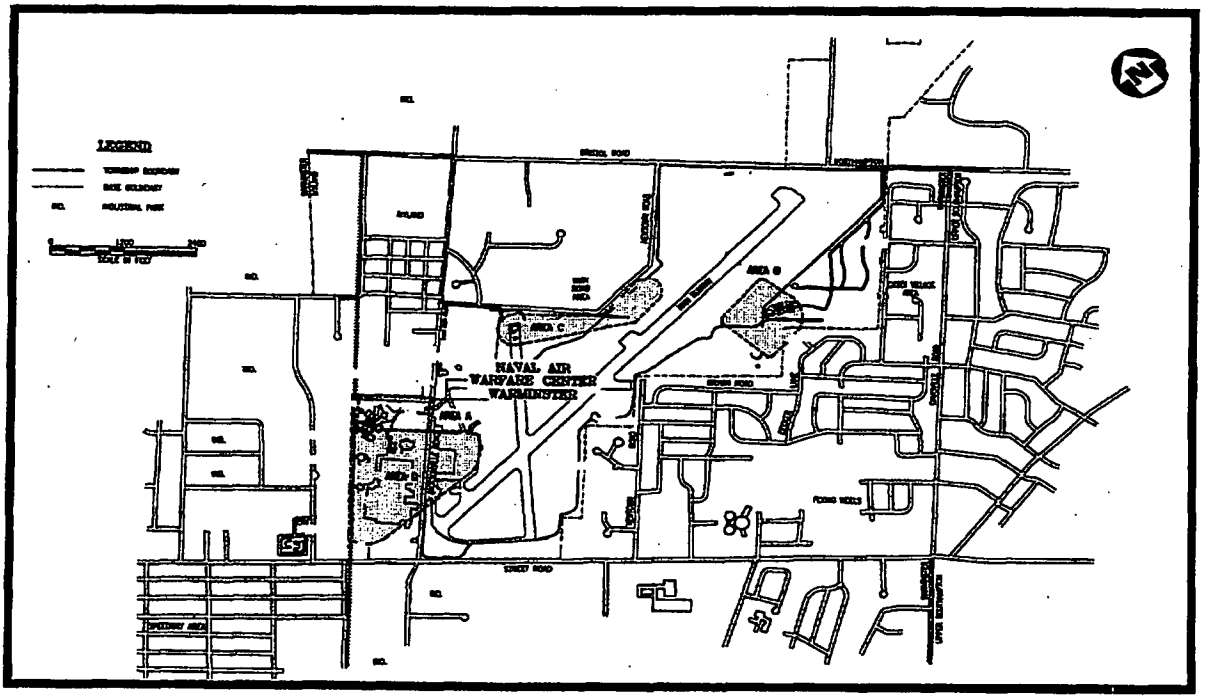

Figure 2. NAWC Site Location Map

sites are located within a generally flat-lying area. An unnamed tributary of Little Neshaminy Creek is located along the northern edge of this area, and the NAWC wastewater treatment facility, jet fuel storage area, and parking lots are immediately to the south.

Site 1 is located near the northern corner of the portion of the NAWC Warminster property lying west of Jacksonville Road, and is adjacent to the NAWC Warminster wastewater treatment plant. Site 1 reportedly operated as a burn pit and disposal area for a wide variety of wastes from approximately 1948 to 1950. Site 2, located immediately southeast of Site 1, reportedly received industrial wastewater sludges and consisted of two disposal trenches.

Site 3 is immediately southeast of Site 2 and was reportedly used from 1955 to 1965 as a burn pit for solvents, paint, roofing materials, and other unspecified chemicals. Also included within Area A is the former location of the eight unlined lagoons used for the storage of wastewater sludges generated by the NAWC treatment plant located immediately south of Area A.

RI work addressing Area A groundwater has been performed in phases. See Figure 3 for well locations. Phase I RI work was conducted from 1989 to 1991 and included soil gas surveys, installation and sampling of overburden and shallow bedrock monitoring wells, an off-base well inventory, and fracture trace analysis. The Phase II RI was initiated in late 1991 and included installation and sampling of additional overburden and shallow bedrock monitoring wells, limited off-base sampling, water level monitoring and hydrogeologic tests to assess potential for contaminant migration to off-base locations and deeper aquifers. The findings of the Phase II RI and a summary of the Phase I RI were included in the Phase II RI report for Area A Groundwater released in April 1993.

An FS for Area A groundwater contamination was also released in April 1993. In September of 1993, an interim remedy ROD for Area A and Area B groundwater selected an interim remedy of pumping and treatment of contaminated groundwater in overburden and shallow bedrock aquifers to control contaminant migration while additional RI work was performed to determine the full nature and extent of Area A groundwater contamination.

After the issuance of the interim remedy ROD, RI work to support the design of the planned Area A extraction well network and to determine the full nature and extent of Area A groundwater contamination continued while a groundwater treatment plant was designed and constructed within Area A. The plant was completed by July 1996 and initially received groundwater pumped from Area C (OU-3). Ongoing RI work for Area A groundwater included the installation, sampling and testing of shallow, intermediate, and deep monitoring wells in downgradient, off-base locations. These additional investigations determined that Dense Non-Aqueous Phase Liquid (DNAPL) contamination was likely to be present in the groundwater underlying Area A.

In response to the findings of the ongoing RI work, the Navy upgraded an air stripper on a nearby municipal supply well [Warminster Township Municipal Authority (WTMA) Well 26] to ensure the water supply was protected and connected adjacent commercial facility to the public water system. Well 26 is located approximately 1,100 feet north of monitoring well HN-16 (see Figure 3). The results of a comprehensive round of water level measurements, water quality sampling for the entire Area A monitoring well network and other post-interim RI data were included in an Area A Offsite Water Level Study Report and Summary Report for Area A and Area D Groundwater, both issued in 1998.

From January through March of 1999, 14 extraction wells were completed within Area A. Data pertaining to the drilling, testing, monitoring and installation of these wells were reported in the Installation/Testing of Area A Groundwater Extraction Wells Report of 1999. The pumping of these extraction wells commenced in July 1999 and the performance of the extraction well network has been closely monitored since that time. A second phase of extraction well installation occurred from December 1999 through January 2000 and included the drilling of 6 potential extraction wells on off-base property north of Area A. One of these wells has since been constructed as an extraction well.

All RI work addressing Area A groundwater is summarized in a final RI report issued in June 2000. Significant conclusions of the RI are as follows:

- Groundwater investigations in Area A have focused primarily on three hydrogeologic units, designated in order of decreasing depth: A, B, and C.

- Hydrogeologic unit B is the hydrogeologic unit of most importance to the investigation in terms of groundwater contaminant occurrence and migration from Area A. This hydrogeologic unit is comprised of the sandstone unit found at depths of 15 to 100 feet along the northern edge of Area A. Flow within this unit is to the north and northwest.

- Hydrogeologic unit B is the unit with the highest levels of Trichloroethene (TCE), carbon tetrachloride, and other contaminants of concern (See Summary of Site Risks).

- The performance data gathered to date from the operation of OU-1 interim remedy indicates that the existing extraction well system is containing the source area of contamination.

- The suspected source of persistently observed Area A groundwater contamination is residual DNAPL contamination present within the bedrock fracture network, and to a lesser degree within the intergranular pores of the rock.

- A diffuse contaminant plume that extends downgradient of the capture zone area of the extraction well network is captured and treated by WTMA Well 26.

SUMMARY OF SITE RISKS

As part of the Focused RI/FS for Groundwater, a risk assessment was conducted with available data to estimate the potential risks to human heath posed by Area A groundwater. Potential human health risks are categorized as **carcinogenic or noncarcinogenic.** A hypothetical carcinogenic risk increase from exposure should not exceed a risk range from 1 X 10^{-6} (an increase of one case of cancer for one million people exposed) to 1 x 10^{-4} (one additional case per 10,000 people exposed). Noncarcinogenic risks are estimated utilizing Hazard Indices (HI), where an HI exceeding one is considered an unacceptable health risk.

A risk assessment for Area A groundwater was initially performed as part of the Interim RI and found that both carcinogenic and non-carcinogenic risks were unacceptable. Carcinogenic risks were estimated to be as high as 9.9 x 10^{-4}. The primary contributors to the carcinogenic risk were identified as TCE, carbon tetrachloride, PCE, 1,1-dichloroethene, 1,2-dicholoethane (1,2-DCA), chloroform, vinyl chloride, and arsenic. The non-carcinogenic risks were estimated to correspond to a Hazard Index of up to 93. The primary contributors to the non-carcinogenic risk were TCE, carbon tetrachloride, PCE, cis-1,2-dichloroethene, arsenic, barium, and thallium. In addition, TCE and PCE were found to exceed Maximum Contaminant Levels (MCLs), developed per the Safe Drinking Water Act, at multiple well locations, while carbon tetrachloride, vinyl chloride, 1,2-DCA, cadmium, manganese, nickel, arsenic, and barium each exceeded MCLs at one well location.

The final RI includes a qualitative risk assessment that compares groundwater quality data generated since the interim RI to MCLs. This assessment found MCL exceedances for TCE, carbon tetrachloride, PCE, 1,1-dichloroethene, cis-1,2-dichloroethene, 1,1,1-trichloroethane (1,1,1-TCA), 1,2-DCA, 1,1,2-trichloroethane, vinyl chloride and benzene. These are the contaminants of concern (COCs) in Area A groundwater per the final RI, with the exceptions of 1,1,1-TCA, which is attributable to non-site related sources, and 1,2-DCA, that was detected in only one well out of 12 rounds of sampling.

The final RI also further assessed risks presented by the metals in Area A groundwater by evaluating sampling results generated since the Interim RI. Only thallium and iron were detected at levels exceeding MCLs. Thallium (MCL of 2 ug/L) was detected in unfiltered samples in 2 of 20 wells at levels of 4.3 ug/L and 5.3 ug/L. However, in each case, no thallium was detected in filtered samples that are more representative of groundwater pumped for use. In this case, thallium is not considered a COC. Iron was detected above the MCL only in wells constructed with steel casing. As a result, the detected iron does not appear attributable to the Site and is not a COC.

An evaluation has also been conducted to determine if Area A groundwater quality is threatened by Area A soils. As part of the RI for Area A soils, surface water and sediment,

contaminant concentrations in Area A soils were compared to soil screening levels protective of groundwater quality to identify soil contaminants present in concentrations above these screening criteria. None of the soil contaminants exceeding these criteria are COCs in Area A groundwater. As a result, Area A soils do not present a threat to groundwater quality.

REMEDIAL ACTION OBJECTIVES

Groundwater underlying Area A at the Site contains contaminants of concern at concentrations that present an unacceptable risk to human health and the environment. An interim remedy, to minimize migration of that contamination, has been implemented. A final remedy for Area A groundwater must be selected and implemented to protect human health and the environment.

The remedial objectives of the final remedy have been identified as follows:

- Prevent further migration of Area A groundwater that presents an unacceptable risk.

- Prevent use of Area A groundwater that present an unacceptable risk.

- Restore Area A groundwater, where technically practicable, to useable standards and cleanup goals established in the Record of Decision (ROD) process.

The RI found that due to the presence of DNAPL contamination in fractured bedrock, restoration of all Area A groundwater to useable standards may not be technically practicable. In response, the Navy has prepared an "Evaluation of Technical Impracticability of Groundwater Restoration for Area A" in accordance with EPA guidance. This evaluation will provide a basis for establishing a zone where applicable or relevant appropriate requirements (ARARs) for groundwater restoration will be waived. Groundwater within this Technical Impracticability (TI) zone will be hydraulically contained, while Area A groundwater downgradient of the TI zone will be restored to useable standards.

SUMMARY OF ALTERNATIVES

Below is a summary of the remedial alternatives developed to meet the remedial action objectives. (Note: The National Contingency Plan (NCP) and CERCLA require that Alternative 1, No Action, also be considered).

Alternative 1: No Action. Under this alternative, no action would be taken. This alternative is presented, as required by CERCLA and the National Contingency Plan (NCP), as a baseline alternative for comparison purposes.

Alternative 2: Existing Extraction, Treatment, and Discharge System; Institutional Controls; and Groundwater Monitoring. Under this alternative, the existing interim remedy extraction network would be maintained and operated and the extracted groundwater would be treated using the existing groundwater treatment plant. Treated groundwater would continue to be discharged to an unnam d tributary of Little Neshaminy Creek. The extraction network would consist of the existing interim remedy system and extraction well, EW-A18, which was recently installed at an off-base location. This alternative also relies on groundwater extraction at WTMA Well 26.

Institutional controls restricting the installation of wells and controlling the pumping of groundwater within and around Area A would be implemented through deed restrictions and the enforcement of existing local ordinances.

A monitoring system would be put into place to monitor the progress of the remedy and to ensure that migration of contamination was not occurring. This alternative would require 5-year reviews until the remedial action is complete.

Alternative 3: Modified Extraction, Treatment, and Discharge System; Institutional Controls; and Groundwater Monitoring. This alternative would include the components of Alternative 2. In addition, this alternative would include an estimated three new extraction wells downgradient of the existing extraction network to enhance contaminant capture and further retard contaminant plume migration. The existing OU1 groundwater treatment system would be modified to accept and treat the increased groundwater flow.

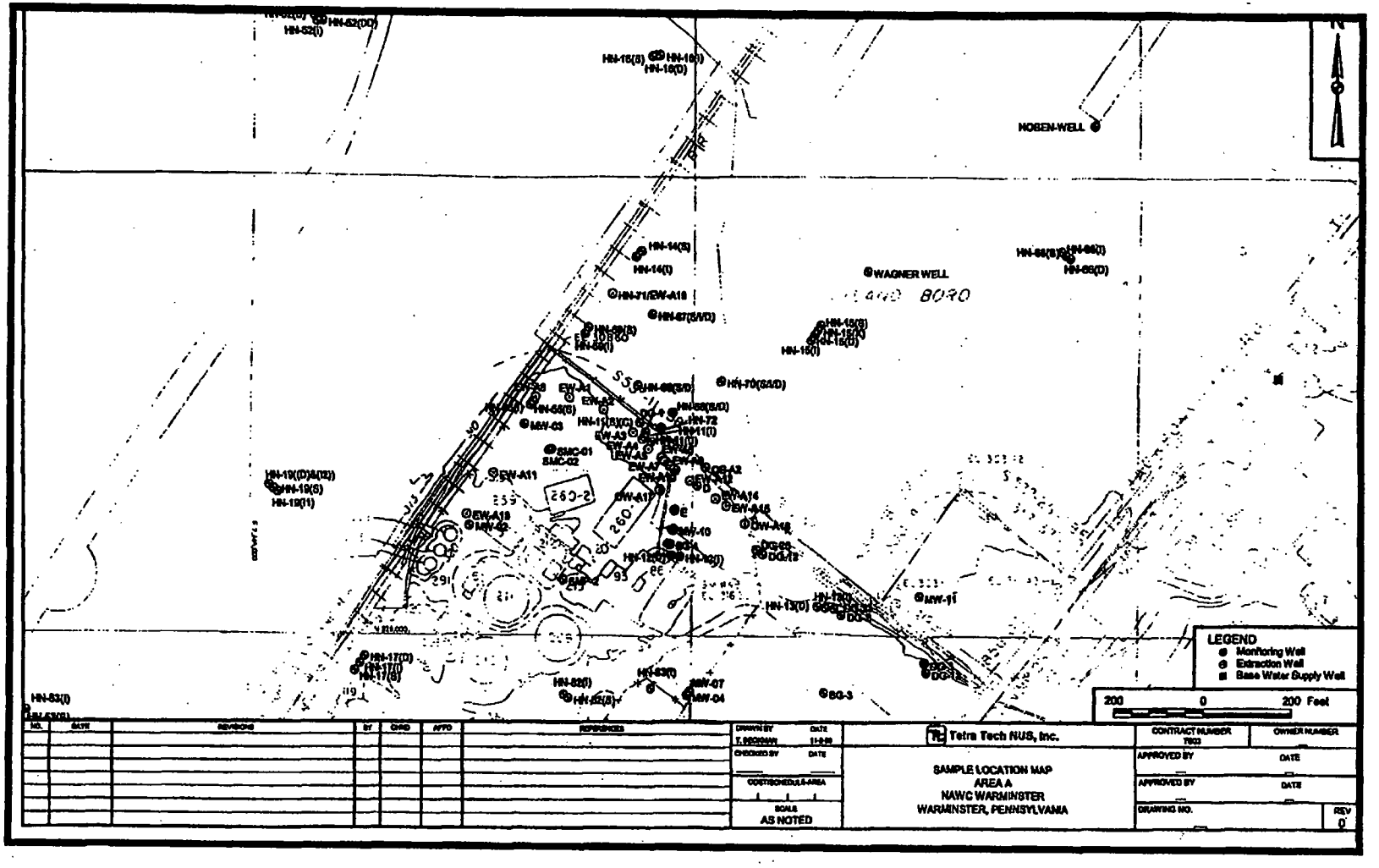

Figure 3. Area A Well Location Map

EVALUATION OF ALTERNATIVES

Each alternative was evaluated using seven of the nine criteria specified in the NCP and EPA guidance. These criteria include overall protection of human health and the environment; compliance ARARs; long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; short-term effectiveness; implementability; and cost. The other two criteria, state acceptance and community acceptance, will be applied and evaluated by the Navy and EPA after comments are received on the Proposed Plan and in public meetings. In addition to the evaluation of individual alternatives, a comparative evaluation applying the same criteria among all the alternatives was completed. The purpose of the comparative evaluation was to identify the positive and negative attributes of each alternative to assist decision-makers in identifying a preferred alternative.

In general, with the exception of Alternative 1, both Alternatives 2 and 3 are protective of human health and the environment, and would reduce potential exposure to contaminated groundwater by preventing use of the groundwater which presents an unacceptable risk and by restricting installation of wells and the pumping of groundwater. Alternative 3 may be considered more protective than Alternative 2, because it includes a more aggressive extraction scheme, which may reduce overall remediation time. Except for the TI zone where restoration is determined to be technically impracticable, Alternatives 2 and 3 would eventually comply with and can be implemented in accordance with all ARARs, especially the chemical-specific ARARs and MCLs.

Alternatives 2 and 3 would provide long-term effectiveness and permanence. Extraction and treatment of contaminated groundwater will effectively prevent expansion of the contaminant plume and would eventually restore Area A groundwater outside of the TI zone to useable standards.

Alternatives 2 and 3 would achieve a significant reduction in contaminant toxicity and volume through treatment. The initial design removal rates of the groundwater extraction and treatment systems for alternatives 2 and 3 are 150 and 600 pounds of Volatile Organic Compounds (VOCs) per year, respectively. Both of these alternatives would use Granular Activated Carbon (GAC) for contaminant adsorption.

Evaluating the short-term effectiveness, Alternative 2 can be fully implemented within six months and would not create any adverse impact on the surrounding community or environment. Alternative 3 could take several years to fully implement and may have the potential for exposure of construction workers to contaminated groundwater during well installation and testing.

Alternative 1 would be simple to implement since no action would occur. Alternative 2 would utilize the existing extraction network and therefore would be readily implementable. Alternative 3 is also implementable, but would require easements, off-site property owner consent, more complex construction design and planning. Locating additional extraction wells will require the performance of additional studies to locate the wells, evaluation of the impact on the existing extraction networks in Area A and D and WTMA Well 26, and the impact new wells may have on non-site related sources. Construction of new wells in the extraction network under Alternative 3 may also require construction of a sub-grade rail crossing which would require the use of complex construction techniques and horizontal drilling as well as an additional transfer sump. The technical and administrative implementability of Alternative 3 is much more complex than that required in implementing Alternative 2.

The 30-year net present worth (NPW) of the three alternatives is listed in Table 1. These costs are made up of a Capital cost and an annual Operation and Maintenance (O&M) cost.

Alternative 1	Alternative 2	Alternative 3
$0	$5,044,000	$6,541,000

Table 1. Net Present Worth of Remediation Alternatives

SUMMARY OF THE PREFERRED ALTERNATIVE

Based on the comparative evaluation of the alternatives, Alternative 2 is the preferred alternative for OU-1A. This alternative effectively limits exposure to contaminated groundwater through institutional controls.

Alternative 2 will also prevent further contaminant migration through the extraction, treatment, and discharge system and restore Area A groundwater outside of the TI zone to useable standards. While Alternative 3 may meet the remedial objectives more quickly than Alternative 2, it is a far more complex alternative in its implementation.

THE COMMUNITY ROLE IN THE SELECTION PROCESS

The Navy solicits written comments from the community on all of the alternatives for Area A groundwater as identified in this Proposed Plan. The Navy has set a public comment period from July 10, 2000 through August 9, 2000 to encourage public participation in the remedy selection process for Area A.

A public meeting has been scheduled for Wednesday evening, July 19th, at 7:00 p.m. in the North American Technology Center 2nd floor conference room, located at 626 Jacksonville Road. Comments from the public meeting and Proposed Plan will be summarized and responses will be provided in the Responsiveness Summary section of the ROD. The ROD is the document that will present the selected remedy.

To obtain further information, contact Mr. Lonnie Monaco, BRAC Environmental Coordinator, at 610-595-0567 x164, or send written comments to:

Mr. Lonnie Monaco
Northern Division
Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, PA 19113-2090

Please note that all comments must be submitted and postmarked on or before August 9, 2000.

GLOSSARY

Administrative Record – Section 113K of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) as amended by the Superfund Amendments and Reauthorization Act (SARA) requires the establishment of an administrative record which forms the basis for the selection of a response action. The administrative record should include the final documents which are a part of the Department of the Navy's (DON's) decision making process.

Carcinogenic – Cancer producing.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) – A federal law passed in 1980 and modified by the Superfund Amendments and Reauthorization Act (SARA) of 1986. The Acts created a special tax that goes into a Trust Fund, commonly known as Superfund, to investigate and clean up abandoned or uncontrolled hazardous waste sites. Under this program, EPA either can pay for a clean up when parties responsible for the contamination cannot be located or are unwilling or unable to perform the work; or can take legal action to force the parties responsible for site contamination to clean up the sit or pay back the federal government for the cost of the cleanup.

National Priorities List (NPL) – EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action, under Superfund. A site must be on NPL to receive money from the Trust Fund for remedial action. The list is based primarily on the score a site receives from the Hazard Ranking System. EPA is required to update the NPL at least once a year.

Remedial Investigation (RI) – An in-depth study designed to gather the data necessary to determine the nature and extent of contamination at a Superfund site; establish criteria for cleaning up the site; Identify preliminary alternatives for remedial actions; support the technical and cost analyses of the alternatives. The RI is usually done with the feasibility study (FS). Together they are usually referred to as the RI/FS.

Volatile Organic Compound (VOC) – Any organic compound that participates in atmospheric photochemical reactions except for those designated by the EPA Administrator as having negligible photochemical reactivity.

MAILING LIST

If you did not receive this Proposed Plan in the mail and wish to be placed on the mailing list for future information pertaining to this site, please fill out, detach, and mail this form to

Mr. Lonnie J. Monaco
BRAC Environmental Coordinator
Northern Division – Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop #82
Lester, Pennsylvania 19113-2090

Name _____ Affiliation _____

Address _____ Phone ( ) _____

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